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Cognitive Management: A Systematic Explication of Applying Cognitive Sciences in Management

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ABSTRACT

Cognitive sciences have significantly advanced the understanding of human behavior; however, the systematic application of these insights in management remains underdeveloped. This study aims to articulate a comprehensive framework for applying cognitive sciences in management, spanning theoretical foundations to practical tools. Using a Systematic Review approach combined with qualitative content analysis, 40 scholarly sources from databases such as Scopus and Web of Science were analyzed. Findings indicate that *Cognitive Management*, as an emerging paradigm, organizes the application of cognitive sciences into five key axes: (1) management of cognitive biases (e.g., Devil's Advocate), (2) choice architecture and nudge (focusing on the design of decision environments), (3) neuro-leadership (using the SCARF model to manage social dynamics), (4) cognitive load management (aimed at optimizing information and process design), and (5) cognitive AI (developing AI systems that interact with and complement human cognition). This framework suggests that, rather than attempting to alter human nature, Cognitive Management leverages the notion of bounded rationality to design environments and organizational processes aligned with the architecture of the mind. While this paradigm provides evidence-based tools that enhance decision-making, leadership, and human resource management, it also faces key challenges related to ethical considerations and the protection of individual autonomy.

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1. Introduction

Management, as a science, has always sought to predict and control human behavior toward organizational goals. However, classical models of management and economics often assume humans as completely rational agents who consistently make decisions based on logical profit and loss. The emergence of Cognitive Science in the second half of the twentieth century and its penetration into social sciences challenged this presupposition. Herbert Simon ignited the first sparks of this paradigm shift by proposing the concept of "Bounded Rationality," ([Simon, 1955](#)).

The evolution of management as a scientific discipline has transformed the perspective of the organizational man. Frederick Taylor, by introducing "Scientific Management," viewed the organization as a machine where maximum productivity could be achieved by optimizing the movements and timing of workers. In this view, humans are biological rational agents who respond only to economic stimuli (wages) ([Taylor, 1911](#)). However, the famous Hawthorne studies led by Elton Mayo demonstrated that productivity is not merely a function of physical and financial conditions but is heavily influenced by social and psychological factors such as a sense of belonging, group relations, and management attention ([Mayo, 2004](#)). These findings founded the "Human Relations" school and brought the social dimension of humans into management. Nevertheless, both Taylor's and Mayo's approaches were still incapable of deeply understanding the internal processes of decision-makers' minds. This gap was filled by Simon's work. By introducing the concept of "Bounded Rationality," Simon argued that decision-makers, due to cognitive limitations in information processing, incomplete knowledge, and limited time, are unable to find the absolute optimal solution; instead, they resort to "Satisficing"—that is, they accept the first solution that meets their minimum criteria ([Oprea, 2024](#)). This idea was the cornerstone of the transition from purely rational to cognitive models in management.

Although Simon's theory was transformative, the systematic application of cognitive science findings in management faced significant delays. This gap between the laboratory knowledge of neuroscience and cognitive psychology and management practice has sometimes come at a steep price. The 2008 global financial crisis is a prime example of this gap. On the verge of this crisis, senior executives of major Wall Street financial institutions, despite having access to data and complex economic models, were unable to predict and prevent the catastrophe ([Nelson and Katzenstein, 2014](#)). The 2008 financial crisis cannot be attributed solely to macroeconomic factors or technical flaws in the financial models. This crisis, at its depth, was an exhibition of systematic cognitive errors that grew in the shadow of neglecting the limitations of the human mind and reached catastrophic dimensions. Understanding these errors is not merely about diagnosing past mistakes but is key to designing more resilient management systems in the future.

- Overconfidence – The Silent Enemy of Rationality

Overconfidence is one of the most powerful and dangerous cognitive biases that engulfed Wall Street managers on the eve of the crisis. This error has three main dimensions: excessive confidence in the precision of personal knowledge and predictions, the illusion of control over unpredictable events, and unrealistic optimism regarding future outcomes ([Moore & Healy, 2008](#)). Managers of financial institutions blindly trust their complex mathematical models

(such as derivative pricing models). They believe that these models can accurately measure and manage the complex risks of the housing market. This was a classic example of the "illusion of control." They were oblivious to the fact that these models were built upon historical data from a period of stable and continuous housing growth and lacked the ability to predict "Black Swans" (rare events) ([Lybeck, 2017](#)). This excessive self-confidence caused them to accumulate a massive volume of toxic assets (high-risk mortgage loans) on their balance sheets and ignore essential precautionary measures. In other words, they severely underestimated the system's "breaking points."

- Halo Effect and Herding – Safety in Following the Crowd

These two biases often interact to fuel irrational collective behavior. This error occurs when a general and positive perception of a person, company, or specific strategy (such as the short-term profitability of an institution) casts a shadow over the judgment of its specific characteristics (such as the excessive risk-taking of its strategy) ([Rosenzweig, 2014](#)). For instance, the apparent success and massive short-term profits of an institution like "Lehman Brothers" led many observers and competitors to regard its high-risk strategy and extremely high financial leverage not as a threat, but as a "secret to success." This phenomenon is the tendency of individuals to follow collective actions and behaviors, even when faced with contradictory personal information. In complex and uncertain environments, managers often view following competitors as a lower-risk and "safe" strategy ([Kameda & Hastie, 2015](#)). When several leading institutions began issuing and expanding Mortgage-Backed Securities and other complex derivatives, the Halo Effect of their success drove others toward blind imitation. No one wanted to be left behind by the "profit train." This Herding behavior created a massive bubble in the housing market and related financial instruments, eventually dragging the entire system into the abyss of collapse.

- Escalation of Commitment – Investing More in a Pit

Escalation of Commitment, or the "Sunk Cost Fallacy," describes the tendency of individuals to continue investing in a failed project or decision solely because they have already spent significant resources (time, money, reputation) on it ([Staw, 1981](#)). This is an irrational attempt to justify the decisions made in the past. With the emergence of the first signs of the housing bubble bursting and an increase in loan defaults, many managers, instead of cutting their losses and exiting the position, increased the volume of their investment. They hoped that by injecting more liquidity, they could improve the market and protect their toxic assets from further devaluation. Psychologically, admitting failure on that scale meant accepting responsibility for a disaster and a fatal blow to their professional reputations. Therefore, hoping for a miracle, they buried themselves deeper into the swamp. This behavior is not justifiable by economic logic alone but is rooted in psychological needs such as Self-justification and Regret Aversion ([Jarmolowicz et al., 2016](#)). Managers prefer to persist with an initial wrong decision in the hope of a miracle rather than accept and face failure.

These three cognitive errors reinforced each other in a vicious cycle: "Overconfidence" initiated high-risk projects, "Halo Effect and Herding" turned it into a pervasive phenomenon, and

"Escalation of Commitment" prevented players from exiting the game in time, ultimately increasing the depth of the crisis to a point where it spiraled out of everyone's control. This crisis clearly demonstrated that an incomplete understanding of the architecture of decision-makers' minds and brains can endanger the entire global economic system. Thus, the central question is how organizations can be designed to compensate for these cognitive limitations and errors and even utilize them for the organization's benefit.

In response to these challenges, "Cognitive Management" has emerged as a novel paradigm. Cognitive Management is defined as the management of the organization, human resources, and strategies based on precise knowledge of the architecture of the human mind and brain ([Powell et al., 2011](#)). Unlike traditional approaches that focus solely on input (stimulus) and output (behavior), Cognitive Management strives to understand Mental Processes, limitations of working memory, the role of emotions in decision-making, and underlying neural structures ([Dane & Pratt, 2007](#)). This approach utilizes findings from fields such as neuroeconomics, evolutionary psychology, and cognitive neuroscience to provide practical tools and frameworks for improving decision-making, leadership, creativity, and team management.

The significance of this research lies in its systematic bridging of the gap between the laboratory findings of neuroscience and cognitive psychology and the real world of management. This paper seeks to explicate the theoretical foundations and identify the practical tools of this emerging field by conducting a systematic review. The main research question is: "What are the main approaches and tools of cognitive sciences applicable in the field of management, and how can they enhance organizational productivity and decision quality?" To answer this question, this study examines the evolution of theories, introduces cognitive errors affecting management, and presents examples of cognitive tools and interventions in areas such as human resource management, strategy, and marketing.

2. Literature Review & Research Background

2.1. From Behaviorism to Cognitivism in Management: A Paradigmatic Shift

The evolution of the perspective on the human within the organization mirrors developments in psychological sciences. In the early twentieth century, the school of behaviorism in psychology was influenced by thinkers such as John Watson and B.F. Skinner. This school considered the mind and its internal processes as a "Black Box" that was impossible to study, focusing solely on the environment (input) and observable behavior (output) ([Watson, 2017](#)). In management, this perspective reached its zenith in Taylor's Scientific Management school, where the worker was viewed as an extension of the machine, and the goal was to optimize movements to maximize efficiency. This era can be termed the era of "Management of Hands."

The occurrence of the "Cognitive Revolution" in the 1950s, with a focus on returning to the study of the mind, transformed this paradigm ([Ash, 2025](#)). Researchers such as Jean Piaget, Noam Chomsky, and Ulric Neisser modeled the mind not as a passive receiver but as an active information processor ([Perner et al., 2002](#)). In management, this shift signified the transition from "Management of Hands" to "Management of Brains." Herbert Simon, by introducing the

concept of "Bounded Rationality," created a bridge between these two worlds and demonstrated that information processing limitations in the mind make purely rational decision-making impossible. This marked the inception of cognitive approaches in organizational and management studies ([Dhami & Sunstein, 2022](#)).

This paradigmatic shift was not limited to the realm of theory alone and gradually manifested in practical management approaches. While Behaviorism sought to control employee behavior by focusing on external rewards and punishments (such as the Taylorist wage and reward system), cognitivism emphasized the role of more internal factors such as perception, interpretation, intrinsic motivation, and mental processes ([Khaw et al., 2023](#)). For instance, Vroom's Expectancy Theory, which focuses on individuals' beliefs regarding the outcomes of behavior and the attractiveness of those outcomes, is a prime example of the penetration of cognitivism into the domain of employee motivation ([Vroom, 1964](#)). Similarly, the design of "Enriched Work Environments" to strengthen intrinsic motivation, or the use of "Self-Managed Teams" that operate based on self-control and collective decision-making, are all rooted in this new understanding that for effective management, one must understand and interact with the "Mental Models" and cognitive maps of employees ([Senge, 1990](#)). Therefore, Cognitive Management is the pinnacle of this evolutionary trajectory, which subjects not only behavior but also the thought and underlying neural mechanisms of human behavior in the organization to its study and management ([Khaneja & Arora, 2024](#)).

2.2. Dual Process Theory: The Backbone of Cognitive Management

One of the main pillars of Cognitive Management is the Dual Process Theory, which was expanded by Daniel Kahneman (Nobel Laureate in Economics) and Amos Tversky. According to this theory, the human mind utilizes two distinct but interacting systems ([Kahneman, 2011](#)).

- System 1 (Fast Thinking): This system operates quickly, automatically, unconsciously, and emotionally, and is based on intuition and heuristics. This system is essential for everyday and immediate decisions, but it is also the origin of most systematic Cognitive Biases.
- System 2 (Slow Thinking): This system is slow, conscious, analytical, and logical, and requires significant mental effort. This system is employed to solve complex problems, perform precise calculations, and facilitate strategic thinking ([Hendijani & Ahmadi, 2024](#)).

Fig. 1 illustrates a schematic view of these two cognitive systems and the parts of the human brain involved in each system.

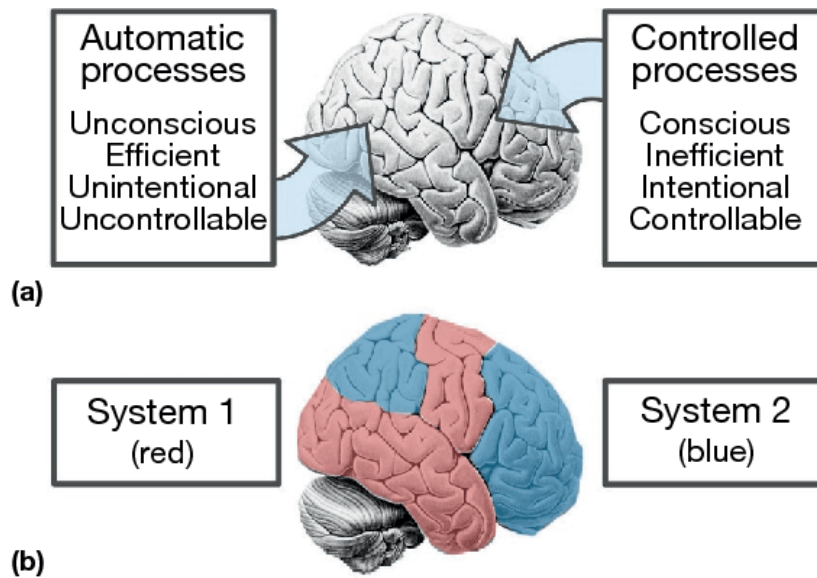


Fig. 1. System one and system two dual-process model (Main, 2024).

Managers often assume that they make their strategic decisions using System 2, whereas research indicates that time pressure, complexity, and fatigue cause many of these decisions to be under the dominance of System 1. For example, a quick judgment about an employee or the evaluation of an investment opportunity is often influenced by intuition (System 1 thinking). An aware cognitive manager learns how to activate System 2 in critical situations to monitor and control System 1 errors ([Hochman, 2024](#)).

2.3. Prospect Theory and Behavioral Economics

Kahneman and Tversky, by proposing Prospect Theory, delivered the final critique to the rational model in economics and earned the 2002 Nobel Prize for Kahneman. This theory demonstrates that individuals make decisions based on the "subjective value" of gains or losses, not their "objective magnitude" ([Kahneman & Tversky, 2013](#)). This theory is based on the following three principles:

1. Evaluation based on a Reference Point: Individuals measure gains and losses not based on final wealth, but relative to a Reference Point (e.g., the purchase price of a stock).
2. Loss Aversion: The pain of losing a specific amount is significantly greater than the pleasure of gaining the same amount. Empirically, the impact of a loss is approximately 2 to 2.5 times the impact of a gain. Fig. 2 illustrates this concept well in the form of a graph, where the horizontal axis represents the spectrum of (gain - loss) and the vertical axis represents (pleasure - pain), with a steeper slope in the loss section.
3. Diminishing Sensitivity: Sensitivity to changes decreases as one moves away from the reference point. That is, the difference between \$1000 and \$1100 seems greater than the difference between \$2000 and \$2100.

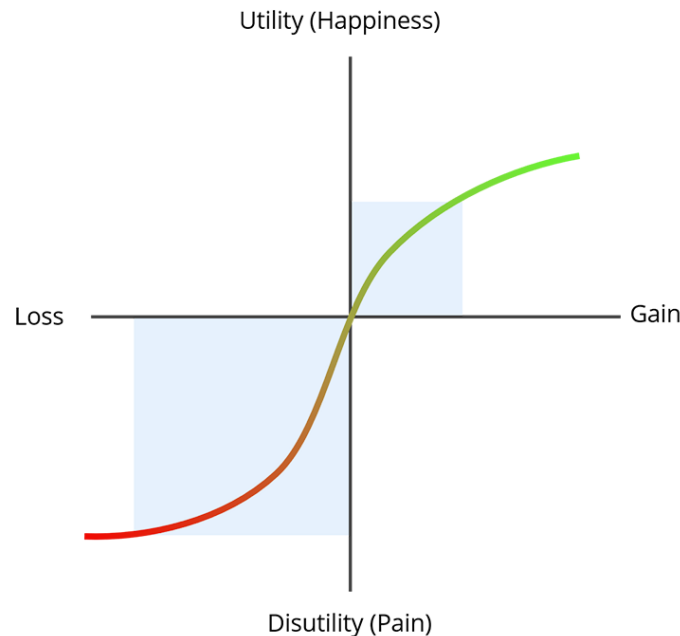


Fig. 2. Conceptualization graph of loss aversion in Prospect Theory (Abdellaoui et al., 2007).

It is worth noting that Behavioral Economics primarily operates at a macro and descriptive level, and by identifying biases, it refines standard economic models. However, cognitive Management operates at the micro and prescriptive levels. This field seeks to utilize findings from behavioral economics and cognitive sciences to design practical interventions within organizations to improve decision-making, leadership, and performance. In other words, behavioral economics describes the "what," while cognitive management offers the "how" of rectifying it ([Monahan, 2018](#)).

2.4. Organizational Neuroscience and Its Sub-fields

This emerging field studies the neural bases of organizational behavior by directly using neuroimaging tools such as fMRI, which shows brain activity, and EEG, which records brain waves ([Ahmadi and Hendijani, 2023](#)). For instance, research has shown that the feeling of injustice activates regions associated with disgust and physical pain (such as the anterior insula) in the brain ([Lieberman, 2007](#)). This finding explains why organizational injustice can provoke extremely intense emotional and behavioral reactions among employees. Organizational Neuroscience seeks to discover neural patterns associated with Transformational Leadership, empathy, and ethical decision-making ([Krendl & Betzel, 2022](#)).

Neuromarketing, an applied sub-field, utilizes organizational neuroscience to understand consumers' subconscious responses to marketing stimuli (such as advertising, packaging design, and pricing). For example, fMRI studies have demonstrated that strong brands (such as Coca-Cola) alter the activity of the brain's reward center (Nucleus Accumbens) in such a way that they may even influence the sensory perception of the product ([Ariely & Berns, 2010](#)).

Generally, neuromarketing can be divided into two broad categories.

1. Neuroscience: Which directly measures brain activity, such as research related to fMRI, EEG, and fNIRS.
2. Psychophysiology: It measures the body's physiological responses controlled by the nervous system.

For example, Eye Tracking is considered part of the second category (psychophysiology). This technique provides objective and quantitative data regarding Visual Attention, which is a significant and direct output of cognitive processing in the brain. Eye tracking has extensive applications in marketing research ([Wedel and Pieters 2008](#)).

Fig. 3 depicts an example of the output of visual advertising research using eye-tracking. The advertisement by the advertising giant Coca-Cola (as previously mentioned) for introducing its new bottle caps, which is part of a recycling and sustainability campaign, has shown significant potential for brand effectiveness. The image of the attached bottle cap, as well as the Coca-Cola brand, bold headline, and key line explaining the concept, initially capture individuals' attention ([Jefferson, 2023](#)).

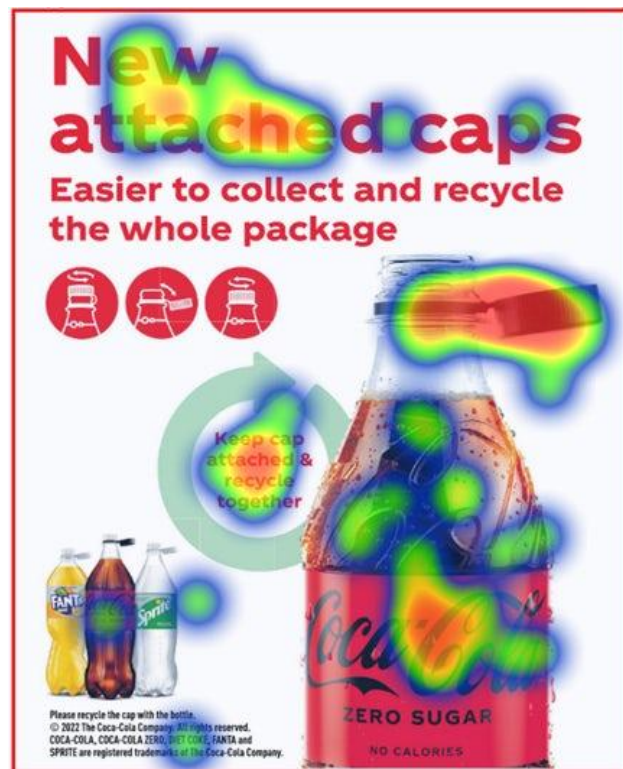


Fig. 3. Image of the promotional poster for Coca-Cola's new bottle caps and the eye-tracking Heat Map (points looked at first) ([Jefferson, 2023](#)).

2.5. Summary of Background and Research Gap

The existing literature clearly indicates that the cognitive paradigm has revolutionized our understanding of organizational behavior. From Macro-perspective theories such as Dual Process

and Prospect Theory to micro-level findings of neuroscience, all emphasize the point that management without understanding the functions of the mind is incomplete and error-prone.

Despite the theoretical richness in separate fields (such as behavioral economics, neuroscience, and decision psychology), a systematic and integrated framework for applying these findings in management practice does not exist. A few papers have sporadically referred to the applications of these sciences, but the absence of a Systematic Review that juxtaposes all these tools and interventions from "theoretical foundations to applications" and covers various management domains (human resources, strategy, marketing, operations) is clearly felt. This paper intends to fill this gap by providing a comprehensive roadmap for researchers and managers interested in "Cognitive Management."

3. Methods

This study was conducted using the "Systematic Literature Review" method. Unlike traditional reviews, this method relies on a transparent, systematic, and reproducible protocol, enabling the comprehensive and objective identification, evaluation, and interpretation of all relevant research in the field of applying cognitive science in management ([Page et al., 2021](#)).

3.1. Search Strategy

The search process in this study was conducted systematically in several stages.

a) Databases

The search was conducted in four reputable international scientific databases covering the indexing of high-quality scientific papers.

- Web of Science (WoS)
- Scopus
- PubMed (despite its medical focus, due to its good coverage of cognitive neuroscience papers)
- Google Scholar (to cover grey literature and ensure comprehensiveness, although due to the high volume of results, screening was performed with priority).

b) Keywords and Search String

Search keywords were determined in English within the framework of the main research concepts. These keywords were searched in the fields of "Title," "Abstract," and "Article Keywords."

- Main Concepts: ("Cognitive Management" OR "Neuro-management" OR "Neuro-leadership" OR "Organizational Neuroscience" OR "Behavioral Strategy")
- Complementary Concepts: ("Cognitive Bias" AND "Decision Making" AND "Manager")
- Applied Concepts: ("Neuromarketing" OR "Cognitive Training" OR "Nudge" AND "Organization*")

A sample search string in the Scopus database is as follows:

(TITLE-ABS-KEY ("cognitive management" OR "neuro-management" OR "organizational neuroscience") OR TITLE-ABS-KEY ("cognitive bias*" AND "decision making" AND (manager* OR leader*)))

c) Eligibility Criteria

The following criteria were transparently defined for the final selection of the studies:

- Inclusion Criteria:
 - Articles published in the time frame of 2000 to 2025 (also considering classical foundations from the 90s as supplementary references).
 - Types of studies: Original research articles, review articles, book chapters, and theoretical studies.
 - Language of the studies: English.
 - Content focus: Studies directly addressing the application of cognitive science, neuroscience, or behavioral economics in management domains (such as leadership, decision-making, strategy, human resources, and marketing).
- Exclusion Criteria:
 - Articles that were purely medical, clinical neurological, or clinical psychological and lacked direct or indirect implications for management.
 - Conference papers without peer review (except for highly relevant cases).
 - General texts, editorials, and short notes without research support.

3.2. Selection and Screening Process

The study selection process was conducted in several stages in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines ([Page et al., 2021](#)).

1. Initial Identification: All records were collected from the databases, and duplicates were removed.
2. Screening based on Title and Abstract: Studies were screened based on the inclusion and exclusion criteria.
3. Full-Text Assessment: Studies that passed the previous filter underwent full-text assessment to ensure compliance with the research objectives.

Ultimately, out of 80 initially identified studies, 40 sources with the highest conceptual and methodological relevance to the research question were selected for final qualitative content

analysis. Fig. 4 shows the PRISMA diagram of the stages of identification, screening, and eligibility, and the number of included studies.

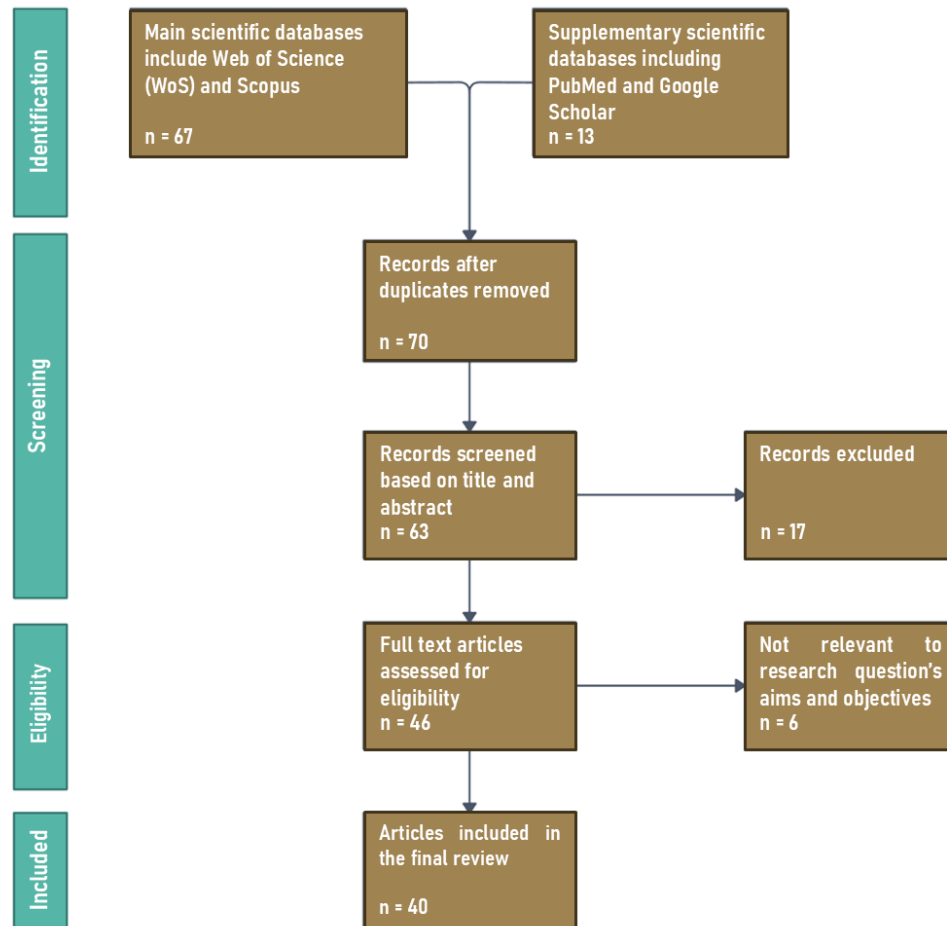


Fig. 4. PRISMA flow diagram of the present study.

3.3. Data Extraction and Analysis

Key data from the 40 selected studies were extracted using a pre-designed form. These data included:

- Bibliographic information (author, year, title).
- Theoretical foundations and conceptual framework used in the study.
- Research methodology.
- Key findings related to the research questions.
- Management domain investigated (decision-making, leadership, strategy, etc..)

The extracted data were examined using Thematic Analysis . In this method, concepts, themes, and patterns present in the texts were identified, coded, and finally organized into main categories (themes) to answer the main research question.

4. Results

As outlined in the Methodology section, the final screening process yielded 40 key studies that formed the empirical and theoretical core of this research. These sources, selected based on their relevance and scientific rigor, cover a diverse range of methodologies from conceptual frameworks and case studies to experimental research and systematic reviews. Table 1 provides a comprehensive overview of the selected studies, organized chronologically from 2002 to 2025. This descriptive analysis serves as the foundation for the subsequent thematic categorization, in which the application of cognitive sciences in management is explained across five distinct dimensions.

Table 1. Summary of Selected Studies for Systematic Review (n=40)

No.	Source (Citation)	Type of Source	Methodology	Key Areas in Cognitive Management
1	(Perner et al., 2002)	Journal Article	Conceptual	Cognitive Science Foundations, Theory of Mind
2	(Paas et al., 2003)	Journal Article	Review	Cognitive Load Theory (Instructional Design)
3	(Hargadon & Bechky, 2006)	Journal Article	Qualitative (Case Study)	Nudge (Innovation & Problem Solving)
4	(Abdellaoui et al., 2007)	Journal Article	Experimental	Prospect Theory, Loss Aversion
5	(Dane & Pratt, 2007)	Journal Article	Conceptual	Intuition in Decision Making
6	(Klein, 2007)	Journal Article	Conceptual / Practical	Bias Management (Pre-mortem Technique)
7	(Lieberman, 2007)	Journal Article	Review	Organizational Neuroscience (Social Processes)
8	(Moore & Healy, 2008)	Journal Article	Review	Cognitive Biases (Overconfidence)
9	(Beshears et al., 2009)	Book Chapter	Empirical / Review	Nudge (Default Options)
10	(Rock, 2009)	Journal Article	Conceptual Framework	Neuro-leadership (SCARF Model)
11	(Ariely & Berns, 2010)	Journal Article	Review	Neuromarketing, Neuro-management
12	(Cheng et al., 2010)	Journal Article	Empirical (Quantitative)	Neuro-leadership (Certainty & Emotion)
13	(Powell et al., 2011)	Journal Article	Conceptual	Behavioral Strategy
14	(Sweller, 2011)	Book Chapter	Conceptual	Cognitive Load Theory
15	(Kahneman & Tversky, 2013)	Book Chapter	Theoretical	Prospect Theory, Decision under Risk
16	(Nelson & Katzenstein, 2014)	Journal Article	Qualitative (Case Study)	Risk Management, Cognitive Errors (Crisis)
17	(Herrmann et al., 2015)	Journal Article	Experimental	Cognitive Biases (Sunk Cost Fallacy)
18	(Kameda & Hastie, 2015)	Journal Article	Review	Cognitive Biases (Herdning)
19	(Jarmolowicz et al., 2016)	Journal Article	Experimental	Cognitive Biases (Sunk Cost Psychology)

No.	Source (Citation)	Type of Source	Methodology	Key Areas in Cognitive Management
20	(Gatlin et al., 2017)	Journal Article	Empirical (Quantitative)	Cognitive Biases (Confirmation Bias)
21	(Martin, 2017)	Journal Article	Experimental	Cognitive Biases (Status Quo & Framing)
22	(Wedel & Pieters, 2008)	Book Chapter	Review	Neuromarketing (Eye Tracking)
23	(Hrgović & Hromatko, 2018)	Journal Article	Empirical (Quantitative)	Cognitive Biases (Sunk Cost Context)
24	(Kirschner et al., 2018)	Journal Article	Conceptual	Collaborative Cognitive Load
25	(Sewell et al., 2019)	Journal Article	Systematic Review	Cognitive Load Management (Training)
26	(Glikson & Woolley, 2020)	Journal Article	Systematic Review	Cognitive AI (Trust & Human-AI Teaming)
27	(Prochazka et al., 2020)	Journal Article	Empirical (Quantitative)	Neuro-leadership (Feedback & Status)
28	(Seeber et al., 2020)	Journal Article	Conceptual	Cognitive AI (AI as Teammate)
29	(Hirsch, 2021)	Journal Article	Conceptual / Practical	Nudge in Corporate Practice
30	(Bergers, 2022)	Journal Article	Empirical (Quantitative)	Cognitive Biases (Status Quo)
31	(Krendl & Betzel, 2022)	Journal Article	Review	Social Cognitive Network Neuroscience
32	(Li et al., 2022)	Journal Article	Empirical (Case Study)	Cognitive Biases (Confirmation Bias & Risk)
33	(Troian et al., 2022)	Conference Paper	Systematic Review	Neuro-leadership (Autonomy/OKRs)
34	(Godefroid et al., 2023)	Journal Article	Systematic Review	Cognitive Biases (Status Quo Measurement)
35	(Khaw et al., 2023)	Journal Article	Systematic Review	Organizational Change & Cognition
36	(Adhikari et al., 2024)	Journal Article	Conceptual	Cognitive Biases (Rational Decision)
37	(Hochman, 2024)	Journal Article	Conceptual	Dual Process Theory
38	(Sandini et al., 2024)	Journal Article	Technical / Conceptual	Cognitive AI (Collaborative Robots)
39	(Krzyżak & Walas-Trębacz, 2025)	Book Chapter	Conceptual	Neuro-leadership (SCARF & Engagement)
40	(Kumar et al., 2025)	Book Chapter	Conceptual	Cognitive Artificial Intelligence

Based on a systematic literature review, the applications of cognitive science in management can be classified into four main axes and one emerging domain. These axes demonstrate how the theoretical foundations of cognitive science can be utilized to design practical managerial tools and interventions within an organization.

4.1. Cognitive Biases in Management

Cognitive biases are systematic deviations from rationality in judgment and decision-making. Cognitive Management, instead of relying on pure rationality, accepts these errors as an inevitable reality in the architecture of the mind and provides tools for identifying, compensating, and "De-biasing" them ([Kahneman et al., 2021](#)). In the following section, the four most critical managerial

cognitive biases are addressed along with a real-world example from management history and a cognitive strategy to overcome them.

- **Confirmation Bias:** Managers tend to search for and interpret information that confirms their prior beliefs and assumptions and ignore contradictory evidence. In simple terms, confirmation bias is described as "seeing only what we want to see or hearing only what we want to hear" However, in practice, this bias is more than that. It involves conscious or unconscious avoidance of information that contradicts or opposes our current views. This cognitive bias leads to a preference for information that confirms pre-existing beliefs or biases ([Gatlin et al., 2017](#)). This bias affects how managers gather information, interpret and recall information, interpret news sources to confirm their current views, and remember events that reinforce their attitudes while forgetting or ignoring things that contradict their views ([Li et al., 2022](#)).

The failure of Blockbuster to accept Netflix's \$50 million offer in 2000 can be attributed to confirmation bias. Blockbuster executives believed that the physical movie rental business model was sustainable and ignored any evidence of the promising growth of online streaming (such as the Netflix model) and the emergence of VOD technology that challenged this belief ([FounderNest, 2025](#)).

One cognitive strategy to avoid this bias is the formal and mandatory appointment of a "Devil's Advocate" in critical strategic meetings within the organization. This role systematically challenges all assumptions, data, and plans. This activates System 2 (analytical thinking) in the group and prevents the dominance of groupthink ([Sunstein & Hastie, 2015](#)).

- **Escalation of Commitment/Sunk Cost Fallacy:** The tendency to continue investing in a failed project or decision solely because significant resources (time, money, reputation) have been spent on it in the past ([Adhikari et al., 2024](#)). The Sunk-Cost Effect is the tendency of humans and animals to continue a behavior, project, or investment because they have previously spent time, money, or energy on it, even though these past investments are irreversible and should not affect the current decision. This effect indicates that living organisms sometimes, instead of disregarding past costs, make decisions based on the interpretation of these investments and evaluation of potential future benefits. Thus, although it is considered a "cognitive error" in economics, in behavioral and evolutionary studies, it can be an adaptive response to temporal and situational conditions ([Hrgović & Hromatko, 2018](#)).

The "Concorde" aircraft project is a classic example of this type of error. The British and French governments continued the project for years after it became clear that it was not economically justifiable, owing to national pride and massive initial investments; essentially, the governments had invested so much money in the Concorde that they were unwilling to abandon it, even though the project's failure was quite obvious ([Durgut, 2023](#)).

The cognitive strategy to overcome this error is Institutional Separation. The team deciding whether to continue or terminate a project must be separate from the team that initiated and executed it. This separation reduces emotional attachment and personal commitment to initial

decisions. Furthermore, establishing "Pre-defined Kill Criteria" before starting the project is essential ([Herrmann et al., 2015](#)).

- **Status Quo Bias:** The "Status Quo Bias" is a well-known bias in behavioral economics and decision psychology. This bias refers to the tendency of the general public, managers, and organizations to prefer the current situation over any new option, even if the new option is logically, economically, or functionally better ([Kahneman et al., 1991](#)). Simply put, when faced with different choices, individuals usually continue with the previous option because change incurs psychological, cognitive or emotional costs. This phenomenon causes individuals to remain in their previous state, even when change is beneficial ([Godefroid et al., 2023](#)). Researchers have explained several mechanisms regarding why the status quo bias occurs ([Bergers, 2022](#)).
 1. **Loss Aversion:** Humans fear loss more than they are happy about gain. Changing the status quo carries the risk of loss; consequently, individuals tend to remain in the current state.
 2. **Cognitive Costs and Decision Complexity:** Change requires information processing, evaluating options, and tolerating uncertainty; therefore, the brain uses the "lower-cost path," that is, continuing the status quo.
 3. **Emotional or Identity Ties to the Status Quo:** Individuals may have a sense of ownership or identity regarding the current situation (Endowment Effect).

Kodak, once a pioneer in digital technology, failed to move quickly toward digital photography because of emotional and structural attachment to the highly profitable film model (status quo) and eventually went bankrupt. Kodak's failure is a prime example of a leading firm's inability to undergo technological transformation. Although it was once the leader of the photography industry, and despite the initial development of the digital camera, the company refused to adopt and pursue strategies based on digital innovation due to concerns about cannibalizing the lucrative film market. This procrastination allowed competitors, including Canon and Sony, who had a flexible, forward-looking approach compatible with emerging technologies, to capture a significant portion of the growing digital photography market ([Niño, 2024](#)).

The cognitive strategy to escape the status quo bias is to frame change as an opportunity to avoid loss (Loss-Framing). Instead of saying "This change will make us richer," one should say "If we do not accept this change, we will lose our market share and customers." Because the human brain is loss-averse, this framing creates a stronger motivation for action ([Martin, 2017](#)).

- **Overconfidence Effect:** The systematic tendency of individuals to believe that their knowledge is more precise and their abilities are greater than they actually are leads to overconfidence. The "Overconfidence Effect" refers to the inclination of individuals to overestimate their abilities, knowledge, predictions, or chance of success, such that their subjective confidence in the correctness of their judgments or decisions exceeds their actual competence. Recent research has shown that this bias in financial and investment decisions

leads to overtrading, imperfect loss aversion, and risk underestimation, thereby reducing the returns and efficiency of management decisions ([Wang et al., 2025](#)).

The sinking of the Titanic in 1912 can be considered the result of a toxic combination of technological, organizational, and individual overconfidence. This ship, the largest moving object built by humans, was dubbed "unsinkable" by the press and experts. The belief that technology could overcome the laws of nature evolved into a dangerous organizational culture at the White Star Line. In practice, this overconfidence manifested itself in a systematic disregard of warnings. On the day of the incident, the Titanic received at least six clear warnings about the icebergs in its path. However, owing to the pressure to break the record for the fastest ocean crossing and the firm belief that the ship was safe in open waters, it maintained nearly its maximum speed. Captain Edward Smith, with experience he himself described as "devoid of any accident," did not take these warnings seriously. This reckless behavior is a prime example of the "Illusion of Control," one of the main forms of overconfidence, where individuals imagine they have more control over events ([Rasmussen, 2024](#); [Ribeiro, 2012](#)).

The cognitive strategy to remedy overconfidence is to use the "Pre-mortem" technique proposed by Gary Klein. In this technique, before making a major decision, the team is told: "Assume a year has passed, and this project was a catastrophic failure. Now write down the reasons for this failure." This systematically neutralizes unrealistic optimism and identifies potential threats ([Klein 2007](#)).

Fig. 5 summarizes the most critical cognitive biases in management and the key strategies to overcome them.

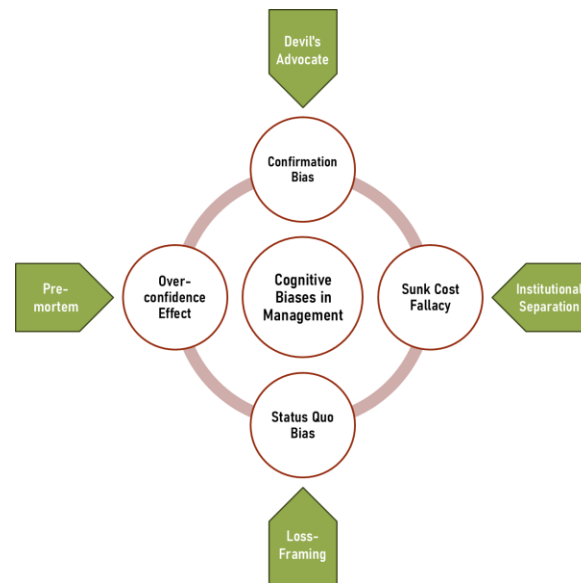


Fig. 5. Managerial cognitive errors and related cognitive strategies.

4.2. Nudge & Choice Architecture

Richard Thaler and Cass Sunstein, by introducing the concept of "Nudge," presented a novel and powerful framework for managing human behavior, shaped based on cognitive limitations and human "Bounded Rationality." Nudge means designing the Choice Architecture in such a way that

individuals' behavior is guided predictably without coercion, forbidding any options, or directly changing economic incentives ([Thaler & Sunstein, 2008](#)). This concept is based on behavioral psychology and behavioral economics and indicates that human decisions are often influenced by the surrounding environment, how options are presented, and the order in which choices are presented ([Sunstein, 2014](#)). In other words, small changes in choice architecture can significantly affect individuals' behaviors, even if they logically know that other options are also available. This approach, by reducing the cognitive cost of decision-making and utilizing the brain's intuitive system (System 1), allows managers to encourage desired organizational behavior without imposing direct orders and reduce human natural resistance to change.

The application of Nudge in human resource and organizational management is extensive and diverse. One of the most well-known examples is changing the default option in pension plans, such that individuals are automatically enrolled unless they choose to opt out. This simple change has led to a dramatic increase in employee participation rates and helped reduce the cognitive burden of decision-making ([Beshears et al., 2009](#)). In the field of innovation and knowledge management, designing shared spaces, such as kitchens, cafés, and wide corridors, increases informal and serendipitous interactions between employees of different departments. This approach, based on social psychology principles, strengthens aspects such as relatedness, a sense of belonging, and trust, and facilitates the flow of ideas and innovation ([Hargadon & Bechky, 2006](#)). Furthermore, in digital work environments, tools such as online bulletin boards, reminder messages, and the default design of emails to promote collaboration and knowledge sharing are considered examples of nudges in the digital age.

In addition to human resources and innovation, Nudge is also applicable to strengthening organizational ethics and honest behavior. For example, placing the signature at the top of financial or contractual forms instead of the bottom increases individuals' cognitive focus on honesty and accountability, and research has shown that the rate of correct reporting and information accuracy increases significantly ([Ariely et al., 2009](#)). In addition, designing defaults that facilitate energy consumption reduction, environmental behaviors, and safety compliance are practical examples of using Nudge to promote organizational and social behaviors. Overall, Nudge, as a psychological and managerial tool, enables the optimization of employee behavior and organizational decision-making without applying direct pressure and creates a bridge between human behavior knowledge and operational management, such that both individuals' intrinsic motivation is preserved and organizational efficiency and effectiveness are increased. Recent research shows that the subject of Nudge remains among the topics of applied behavioral sciences in corporate environments, including risk management, recruitment, employee compensation and group decision-making ([Hirsch, 2021](#)).

4.3. Neuro-leadership

David Rock, by introducing the SCARF model, presented a neuroscience-based framework for effective leadership. This model is based on the principle that the human brain processes social interactions with the same primary mechanisms of "reward" and "threat." The activation of the threat circuitry causes cortisol secretion and the activation of the "fight or flight" response, which

impairs cognitive ability. In contrast, activation of the reward circuitry through dopamine secretion leads to engagement and creativity ([Rock, 2009](#)). Fig. 6 shows this famous model.

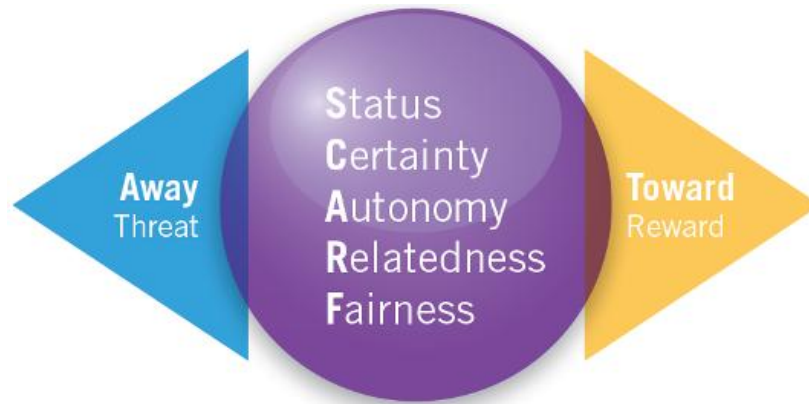


Fig. 6. The SCARF Neuro-leadership Model ([Krzyżak & Walas-Trębacz, 2025](#)).

The main indicators of this model are as follows:

- **Status:** The sense of relative importance of the individual compared to others; how much "rank" or "value" an individual possesses. Changes in status, promotion, or demotion can elicit strong cognitive and emotional reactions. Providing constructive feedback using the "sandwich method" (starting with strengths, offering criticism, ending with praise) and emphasizing "improvability" rather than the "fixedness" of abilities (Growth Mindset) reduces the threat to status ([Prochazka et al., 2020](#)).
- **Certainty:** The need for predictability of conditions; when the future and consequences are clear, stress and anxiety decrease; ambiguity and uncertainty put the brain in an alert state. Transparent and frequent communication, even when there is not much to say, sharing the roadmap, clear short-term goals, and explaining the reasons for changes reduce the cognitive load resulting from ambiguity ([Cheng et al., 2010](#)).
- **Autonomy:** The sense of control and agency over one's choices and work; having the freedom of action and a sense of control over processes leads to motivation and satisfaction. Genuine delegation of authority means allowing employees to choose how to perform their work. Implementing the "Objectives and Key Results" (OKRs) model, where the path to achieving the goal is partially up to the individual, is an example of genuine delegation ([Troian et al., 2022](#)).
- **Relatedness:** The sense of social connection and belonging with others; the feeling that "I am part of the group," I am accepted, and I am interacting with others. This sense increases social security and cooperation among individuals. Encouraging the formation of "Communities of Practice," holding informal team events, and creating a Psychologically Safe space where individuals can express their opinions without fear of humiliation reinforce this feeling ([Edmondson, 2018](#)).

- Fairness: A sense of justice and fairness in behaviors, decisions, and resource distribution; when individuals perceive fairness, their trust and participation increase. Transparency in decision-making processes (such as promotions and rewards), explaining the logic behind decisions, and establishing fair systems for everyone reinforce a sense of fairness ([Aplin-Houtz, 2025](#)).

4.4. Cognitive Load Management

Cognitive Load Management refers to the process of designing and organizing information, tasks, and work environments to match individuals' limited Working Memory capacity; its goal is to reduce "Extraneous Load," regulate "Intrinsic Load" according to employees' skill levels, and increase "Germane Load" to facilitate schema construction and storage in long-term memory. Cognitive Load Theory (CLT), founded by Sweller, demonstrates that when cognitive load exceeds working memory capacity, learning and decision-making efficiency decline, and errors and delays increase ([Paas et al., 2003](#); [Sweller, 1988](#)). From an organizational perspective, effective cognitive load management means designing training, user interfaces, and work processes in such a way that unnecessary information is eliminated, work complexities are broken down into digestible parts, and employees are enabled to focus on valuable cognitive activities through appropriate support (e.g., worked examples, checklists, or timing reminders) ([Paas et al., 2003](#)).

In practical organizational applications, cognitive load management strategies include CLT-based instructional design for employee training in real environments (Workplace Training), facilitating group collaboration through mechanisms for creating "Collective Working Memory" and reducing transaction costs of team interaction, and optimizing dashboards and information systems to reduce unnecessary distractions. Systematic reviews of work environments show that applying CLT principles in professional training (e.g., in the healthcare sector) improves performance and learning by reducing intrinsic and extraneous loads and employing methods such as staged simulations, microlearning, and structured feedback ([Sewell et al., 2019](#)). Furthermore, recent research extending CLT to collaborative learning indicates that in complex team tasks, distributing information among members (Transactive Memory) and designing roles and information flow can reduce individual cognitive load and increase collective problem-solving efficiency; however, if group interactions themselves generate additional cognitive costs, a reverse effect occurs; therefore, task architecture and support for knowledge exchange are essential ([Kirschner et al., 2018](#)).

In a nutshell, Cognitive Load Theory states that human Working Memory capacity is limited. When the input information exceeds this capacity, learning and decision-making are impaired. Cognitive Management optimizes information design ([Sweller, 2011](#)). Designing management dashboards that use Data Visualization (charts, heat maps) and the "Chunking" technique to group related information instead of presenting raw and massive data is another application of CLM in management. This reduces cognitive overhead and enables a faster understanding of patterns and insights. It also involves simplifying and standardizing internal processes (such as budget approval or reporting) to free up managers' minds for more complex decisions.

4.5. Cognitive AI and Human-Machine Interaction

The emerging field of Cognitive AI addresses the design of artificial intelligence systems that not only mimic human cognitive functions but are also designed to interact with and complement human cognition. Cognitive AI refers to systems that, in addition to data processing, simulate abilities similar to human cognitive functions, including Context Understanding, reasoning, adaptive learning, and decision-making. This branch of AI relies on human cognitive models, neuroscience, and cognitive psychology and has been proposed, especially in organizational environments, as a tool for enhancing decision-making power, reducing cognitive errors, and increasing productivity. Research indicates that Cognitive AI systems are capable of analyzing massive volumes of information with semantic understanding and consideration of environmental uncertainty, extracting hidden patterns, and providing Decision Support recommendations; these features are particularly important in areas such as risk analysis, operations management, and senior executive decision support ([Sandini et al., 2024](#)). The application of these systems in organizations is designed not to replace humans but to complement their cognitive capacities, specifically by reducing cognitive load, filtering unnecessary information, and strengthening predictive power ([Kumar et al., 2025](#)).

In the realm of human–AI Interaction, organizations are utilizing Cognitive AI to create systems capable of interpreting user behavior, learning from interactions, and adapting to human decision-making styles. Recent research shows that cognitive systems, when designed as "Human–AI Teaming," can significantly improve team performance in complex tasks such as emergency operations, supply chain management, and real-time data analysis (Seeber et al., 2020). Additionally, studies have demonstrated that AI Trust, decision transparency (explainability), and cognition-centric user interface design are determinants of the acceptance rate of Cognitive AI systems by employees ([Glikson & Woolley, 2020](#)). Organizations should focus on designing optimal cognitive interactions, such as providing understandable explanations, gradual adaptation, learning from human feedback, and preventing users' over-reliance on the system, which leads to establishing effective human-machine collaboration and sustainable exploitation of Cognitive AI capacities.

5. Discussion

The present research, through a systematic review, demonstrates that "Cognitive Management" is not a passing fad or a marginal approach but a necessary and scientific return to the human roots of organizational functioning. This paradigm marks a turning point: by moving beyond Taylorist mechanical models and beyond purely social Mayo-style approaches, it directs attention to the fundamental core of organizational behavior—namely, the "Mind and Brain." Drawing on robust findings from neuroscience, cognitive psychology, and behavioral economics, Cognitive Management offers precise, testable, and evidence-based tools for predicting, understanding, and guiding organizational behavior.

5.1. Summary and Explication of Findings: From Theory to Practice

In response to its main question, this study explicated the application of cognitive sciences in management through a systematic five-dimensional framework.

- **Bias Management:** Cognitive Management does not negate rationality; rather, it realistically accepts the limitations of the brain. As the findings indicate, tools such as the pre-mortem ([Klein, 2007](#)) and Devil's Advocate ([Sunstein & Hastie, 2015](#)) reduce System 1 errors (e.g., overconfidence, confirmation bias) not through advice, but by redesigning decision-making processes.
- **Choice Architecture:** The concept of Nudge ([Thaler & Sunstein, 2008](#)) reflects the principle that rather than attempting to change human nature—an endeavor inherently resistant to change—organizations can design the decision environment to align with that nature of humans. Evidence, such as increasing retirement saving rates, demonstrates that small, low-cost changes in the default option can significantly influence productivity and welfare.
- **Neuro-leadership:** The SCARF model ([Rock, 2009](#)) creates a direct link between neuroscience and human resource management. It teaches managers how to design their daily interactions in ways that avoid activating the threat circuitry (cortisol) and instead stimulate the reward system (dopamine), thereby promoting engagement, creativity, and collaboration.
- **Cognitive Load Management:** Understanding the constraints of Working Memory ([Sweller, 1988](#)) guides managers toward designing information systems, dashboards, and processes that reduce cognitive overhead and free mental resources for strategic thinking and complex problem-solving.
- **Emerging field of cognitive AI** focuses on designing systems that mimic and complement human cognition. AI-based decision assistants can analyze massive datasets while functioning as “Cognitive Warning Systems,” identifying patterns of potential bias—for example, alerting a manager to excessive reliance on initial information (anchoring). AI can automate repetitive, information-dense tasks, allowing managers to focus on strategic and creative judgments.

Collectively, these findings demonstrate that Cognitive Management provides a powerful prescriptive paradigm that uses deep insights into mental processes to offer a rich, practical toolkit for addressing organizational complexity.

5.2. Practical and Organizational Implications

These findings have several significant implications for organizations.

- **Establishing Behavioral Insight Units:** Leading organizations should create teams composed of cognitive science experts, data analysts, and business specialists. Their role is to systematically field-test cognitive interventions (e.g., form designs, reward structures, and communication patterns) using A/B testing to optimize organizational processes.
- **Redesigning Leadership Development Programs:** Managerial training must extend beyond technical competence to develop cognitive capabilities, including self-awareness of biases,

emotional regulation, critical thinking, and foundational knowledge of behavioral neuroscience.

- **Human-Centered Design of Systems and Spaces:** From software interfaces to the physical workspace, systems should be designed based on cognitive principles, such as reducing cognitive load, promoting meaningful social interaction, and enhancing psychological safety.

5.3. Limitations and Ethical Considerations

Despite its promise, implementing Cognitive Management involves several challenges.

- **Ethical Challenges:** There is a fine line between “legitimate influence” and unconscious “manipulation.” The use of nudges without transparency can undermine trust and autonomy. A guiding principle is that interventions should empower individuals to achieve goals they endorse.
- **Contextual and Cultural Limitations:** Many cognitive science findings emerge from Western contexts. Validating these insights in Eastern, Islamic, and non-Western organizational cultures is essential, as cultural factors may influence bias patterns and behavioral responses is essential.
- **Measurement Complexity:** Measuring the return on investment (ROI) of cognitive interventions (e.g., de-biasing training) is often complex and long-term, presenting challenges for evaluation and adoption.

6. Conclusions

Specifically, for managers in government and public organizations, the findings of this study offer actionable insights for optimizing policy design and resource allocation. First, applying Choice Architecture and Nudging can significantly enhance citizen compliance and welfare without resorting to coercive regulations. For instance, setting beneficial "default options" in public health enrollment or tax compliance systems can streamline decision-making for citizens. Furthermore, given the high sensitivity of public spending, combating the Escalation of Commitment (Sunk Cost Fallacy) is crucial. Public administrators are advised to establish independent review committees and enforce predefined "kill criteria" for large-scale infrastructure or IT projects. This institutional separation prevents the waste of taxpayer money on failing initiatives driven by political prestige and past investments.

Second, regarding internal dynamics, public sector leaders can utilize neuro-leadership principles (particularly the SCARF model) to navigate the rigid hierarchies and bureaucratic structures often found in government bodies. By fostering a culture of "Psychological Safety" and minimizing "Social Threat," managers can mitigate employee resistance to change and unlock innovation in typically conservative environments. Additionally, Cognitive Load Management is vital for reducing bureaucratic "red tape." By simplifying administrative procedures, decluttering information dashboards, and optimizing workflows, leaders can minimize the "extraneous load"

on civil servants. This cognitive unburdening frees their mental capacity for complex problem-solving and strategic policy analysis, ultimately leading to more agile and responsive public organizations.

Cognitive Management ultimately represents an invitation to scientific humility: the recognition that managers' minds, like all human minds, are vulnerable to systematic errors and require structured corrective mechanisms. This paradigm does not threaten managerial authority; rather, it enhances the precision, quality, and effectiveness of managerial decision-making.

The future of management belongs to organizations that institutionalize Cognitive Literacy within their cultural DNA—organizations where understanding mental functions is considered a core managerial competency and a foundational principle in designing systems, strategies, and organizational culture. As this research shows, the shift from “management of hands” and even “management of hearts” toward “management of brains” constitutes one of the most profound transformations in management science in the twenty-first century.

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Conflicts of interest

The authors declare no conflicts of interest.

Authors contribution statement

Mohammad Milad Ahmadi was responsible for conceptualization, methodology, investigation, data curation, formal analysis, visualization, software development, project administration, supervision, validation, resources, and writing – original draft. Peyman Hajizadeh and Changiz Valmohammadi contributed to writing – review and editing. All authors have read and approved the final manuscript.

Data Availability Statement

The data supporting the findings of this study are not publicly available because the research is based exclusively on previously published sources. As a systematic review, all analyzed materials consist of copyrighted articles retrieved from academic databases (e.g., Scopus and Web of Science) that cannot be redistributed because of licensing restrictions. However, the list of all included sources is fully provided within the manuscript, and additional details are available from the authors upon reasonable requests.

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